

## Fault Detection, Isolation and Recovery (FDIR) Portable Liquid Oxygen Hardware Demonstrator

- Demonstration description

The Fault Detection, Isolation and Recovery (FDIR) hardware demonstration will highlight the effort being conducted by Constellation's Ground Operations (GO) to provide the Launch Control System (LCS) with system-level health management during vehicle processing and countdown activities. A proof-of-concept demonstration of the FDIR prototype established the capability of the software to provide real-time fault detection and isolation using generated Liquid Hydrogen data. The FDIR portable testbed unit (presented here) aims to enhance FDIR by providing a dynamic simulation of Constellation subsystems that feed the FDIR software live data based on Liquid Oxygen system properties. The LO2 cryogenic ground system has key properties that are analogous to the properties of an electronic circuit. The LO2 system is modeled using electrical components and an equivalent circuit is designed on a printed circuit board to simulate the live data. The portable testbed is also be equipped with data acquisition and communication hardware to relay the measurements to the FDIR application running on a PC. This portable testbed is an ideal capability to perform FDIR software testing, troubleshooting, training among others.

- Amount of attendee interaction expected (additional consideration will be given for this criteria)

The functionality of the portable testbed will be demonstrated. FDIR team members will discuss FDIR, demonstrate the selection of failure modes from the portable testbed, show the attendees the resulting impacts on the telemetry data from a command and control touchscreen user interface, and the attendees will witness the real-time isolation of the faults by FDIR software running on a separate PC. After formal presentation, there will be opportunities for the attendees to exercise the unit and see the system in operation. (interaction = high)

- Educational value

The portable unit will serve as a training capability among other things. This demonstration will show the ability of such approaches to understand the application, train the personnel on their use and, in general, provide the customer with an hands-on experience of the approach.

- Demo requirements (size, weight, facilities needed, etc.)

Table 4x8 will house the entire demo

Electrical outlets (120VAC) at the table to power the portable testbed and PC/monitors

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